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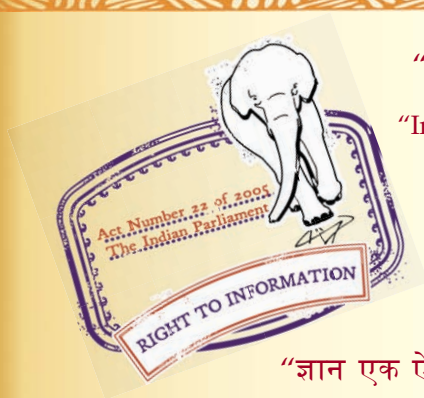
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IS 5003 (1968): Cadmium oxide for electroplating [CHD 5: Electroplating Chemicals and Photographic Materials]



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Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS : 5003 - 1968

(Reaffirmed 2003)

Indian Standard
**SPECIFICATION FOR
CADMIUM OXIDE FOR ELECTROPLATING**

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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Indian Standard

SPECIFICATION FOR CADMIUM OXIDE FOR ELECTROPLATING

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SPECIFICATION FOR CADMIUM OXIDE FOR ELECTROPLATING

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 31 December 1968, after the draft finalized by the Electroplating Chemicals Sectional Committee had been approved by the Chemical Division Council.

0.2 In the plating industry the cyanide bath, which is made up from sodium cyanide and to which wetted cadmium oxide is added, is used almost exclusively. The exact composition of cadmium complex is not known though it is usually considered to be $\text{Na}_2\text{Cd}(\text{CN})_4$. Stable, non-critical additives consisting of organic compounds like dextrin and cellulose derivatives, used together with traces of dissolved nickel, make possible highly lustrous cadmium coating.

0.3 In the formulation of this standard due weightage has been given to international coordination among the standards and practices followed in different countries, in addition to relating it to the practices in the field in this country. This has been met by deriving assistance from B.S. 2868-1957 'Cadmium anodes and cadmium oxide for electroplating' issued by the British Standards Institution, and GOST 11120-65 'Cadmium oxide' issued by Komitet Standartov, Mer i Izmeritel' nyh Priborov pri Sovete Ministrov S.S.S.R., Moscow (U.S.S.R.).

0.4 This standard has clause 3.1 which provides for agreement between the purchaser and the supplier.

0.5 For the purpose of deciding whether a particular requirement of this standard has been complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and test for cadmium oxide used in electroplating.

*Rules for rounding off numerical values (*revised*).

2. REQUIREMENTS

2.1 Description — The material shall be in the form of brown powder insoluble in water and readily soluble in acids. It shall correspond in composition essentially to CdO. It shall not contain free metal particles and shall be free from dirt and visible impurities.

2.2 The material shall also comply with the requirements given in Table 1 when tested according to the methods prescribed in Appendix A. Reference to the relevant clauses of Appendix A are given in col 4 of Table 1.

TABLE 1 REQUIREMENTS FOR CADMIUM OXIDE FOR ELECTROPLATING

SL No.	CHARACTERISTIC	REQUIREMENT	METHOD OF TEST (REF TO CL No. IN APPENDIX A)
(1)	(2)	(3)	(4)
i)	Cadmium oxide (as CdO), percent by weight, <i>Min</i>	99.0	A-2
ii)	Insoluble matter (in cyanide), percent by weight, <i>Max</i>	0.1	A-3
iii)	Loss on ignition, percent by weight, <i>Max</i>	0.5	A-4
iv)	Zinc (as Zn), percent by weight, <i>Max</i>	0.005	A-5
v)	Lead (as Pb), percent by weight, <i>Max</i>	0.03	A-6
vi)	Copper (as Cu), percent by weight, <i>Max</i>	0.000 5	A-7
vii)	Iron (as Fe), percent by weight, <i>Max</i>	0.000 5	A-8

2.3 It shall be free from mercury when tested by the method given in Appendix B.

3. PACKING

3.1 The material shall be packed in suitable containers as agreed to between the purchaser and the supplier.

4. MARKING

4.1 The containers shall be marked with the name of the material, net weight, name of the manufacturer and his recognized trade-mark, if any; and the lot number and date of manufacture.

4.1.1 The containers may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

5. SAMPLING

5.1 The method of preparing representative samples of the material and the criteria for conformity of the material to this specification shall be as prescribed in Appendix C.

APPENDIX A

(Clause 2.2)

ANALYSIS OF CADMIUM OXIDE

A-1. QUALITY OF REAGENTS

A-1.1 Unless specified otherwise, pure chemicals and distilled water (see IS : 1070-1960*) shall be used in tests.

NOTE — ' Pure chemicals ' shall mean chemicals that do not contain impurities which affect the results of analysis.

A-2. DETERMINATION OF CADMIUM OXIDE

A-2.0 General — Cadmium oxide is determined employing electro-gravimetric method.

A-2.1 Reagents

A-2.1.1 *Dilute Sulphuric Acid* — 5 N approximately.

A-2.1.2 *Phenolphthalein Indicator Solution* — prepared by dissolving 0.1 g in 100 ml of 60 percent (v/v) of rectified spirit conforming to IS : 323-1959†.

A-2.1.3 *Sodium Hydroxide Solution* — 0.1 N approximately.

A-2.1.4 *Potassium Cyanide Solution* — 20 percent (w/v).

A-2.2 Procedure — Dissolve about 0.5 g of the sample in just sufficient quantity of dilute sulphuric acid, and filter through a sintered-glass crucible (G No. 4) washing with minimum quantity of warm water. Add a drop of phenolphthalein indicator and neutralize excess acid with sodium hydroxide solution. Then add potassium cyanide solution, dropwise, with constant stirring, till the precipitated cadmium hydroxide just dissolves. Avoid a large excess of potassium cyanide. Dilute the solution to 150 ml and electrolyse the cold solution, using tared platinum wire gauze cathode

*Specification for water, distilled quality (revised).

†Specification for rectified spirit (revised).

and a current of 0.5 to 0.7 A at 4.8 to 5.0 V. At the end of 6 hours, increase the current to 1.0 to 1.2 A and continue the electrolysis for another hour. Wash the split clock glass and sides of the beaker with about 20 ml of water and continue electrolysis for about 15 minutes. If the newly exposed surface of the cathode remains bright, thus indicating that the deposition of cadmium is complete, remove the electrolyte from the electrodes, rinse immediately with water, stop the current and rinse the cathode with alcohol. Dry at 100°C, cool and weigh. Test the residual electrolyte for cadmium, if any.

A-2.3 Calculation

$$\text{Cadmium oxide (as CdO), percent by weight} = 114 \times \frac{W_1}{W}$$

where

W_1 = weight in grams of the cadmium metal deposited, and

W = weight in grams of the material taken for the test.

A-3. DETERMINATION OF INSOLUBLE MATTER (IN CYANIDE)

A-3.1 Reagents

A-3.1.1 *Potassium Cyanide* — solid.

A-3.2 Procedure — Weigh accurately about 20 g of sample and 30 g of potassium cyanide and mix by coning or repeated stirring (there shall be no grinding). Introduce the mixture into a 100-ml conical flask which is half filled with distilled water. Heat the mixture from 43° to 48°C, swirl for 5 minutes, and then maintain the flask at $44.0^\circ \pm 0.5^\circ\text{C}$ for four hours. Dilute to one litre, shake, set aside overnight and then filter through a sintered glass crucible (G No. 4). Wash the residue with cold water, dry the crucible and reweigh.

A-3.3 Calculation

$$\text{Insoluble matter, percent by weight} = \frac{W_1 \times 100}{W}$$

where

W_1 = weight in grams of the residue, and

W = weight in grams of the material taken for the test.

A-4. DETERMINATION OF LOSS ON IGNITION

A-4.1 Procedure — Weigh accurately about 1 g of the sample and heat or two hours in a open muffle furnace at 800°C. Determine the loss in weight after cooling the residue in a desiccator.

A-4.2 Calculation

$$\text{Loss on ignition, percent by weight} = \frac{W_1 \times 100}{W}$$

where

W_1 = loss in weight in grams, and

W = weight in grams of the material taken for the test.

A-5. DETERMINATION OF ZINC

A-5.0 General — Zinc is determined colorimetrically using methyl violet as indicator. It is also determined colorimetrically using *p*-dimethyl aminostyryl- β -naphthiozole methiodide.

A-5.1 Reagents

A-5.1.1 Ammonium Thiocyanate Solution — 60 percent (*w/v*) and 10 percent (*w/v*) solutions in water.

A-5.1.2 Ammonium Chloride Solution — 20 percent (*w/v*).

A-5.1.3 Ammonium Hydroxide — conforming to IS : 799-1955*.

A-5.1.4 Ammonium Hydroxide Ammonium Chloride Solution — prepared by mixing 15 ml of ammonium hydroxide and 15 ml of ammonium chloride solution with 200 ml of water.

A-5.1.5 Dilute Sulphuric Acid — approximately 18 N.

A-5.1.6 Dilute Hydrochloric Acid — approximately 3 N.

A-5.1.7 Standard Hydrochloric Acid — 0.5 N.

A-5.1.8 Tartaric Acid Solution — 25 percent (*w/v*).

A-5.1.9 Methyl Orange Indicator — Dissolve 0.1 g of the indicator in 100 ml of water.

A-5.1.10 Methyl Violet — Dissolve 0.1 g of the indicator in 200 ml of water.

A-5.1.11 Standard Zinc Solution — Dissolve 4.240 g of zinc sulphate ($\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$) in water and dilute to 1 000 ml. Further dilute 10 ml of this solution to 1 000 ml. One millilitre of the solution contains 0.01 mg of zinc (as Zn).

A-5.1.12 Wash Mixture — Mix 50 ml of 60 percent (*w/v*) ammonium thiocyanate solution, 200 ml of water and 1 ml of sulphuric acid.

*Specification for ammonia, liquor, technical.

A-5.1.13 Isoamyl Alcohol

A-5.2 Procedure — Weigh accurately about 1.00 g of the material and dissolve in dilute hydrochloric acid. Transfer the solution to a separating funnel of 50 ml capacity. Add 3 ml of 60 percent *w/v* ammonium thiocyanate solution and 0.1 ml of dilute sulphuric acid. Mix and add 10 ml of isoamyl alcohol. Shake the contents of the flask for 2 minutes. Allow the layers to separate and reject the lower aqueous layer. Wash the isoamyl alcohol portion thrice, with 10 ml portions of the wash mixture, by shaking each time for 2 minutes. Transfer the isoamyl alcohol layer into another separating funnel with 10 ml of ammonium hydroxide and add the washings to the contents of the second separating funnel. Shake the contents of the second separating funnel briskly for 2 minutes and allow the layers to separate. Transfer the lower aqueous layer into a 25-ml measuring flask and make up to volume (solution A).

A-5.2.1 Preparation of the Standard Solution — Take 10 ml of water into a separating funnel and treat in the same way as the test sample. Dilute to 25 ml in a measuring flask (solution B).

A-5.2.2 Determine the quantity of the acid necessary to neutralize the solutions as follows.

A-5.2.2.1 Take 2 ml of the solution A in one test tube and 2 ml of the solution B in another. Neutralize the test solutions with standard hydrochloric acid with methyl orange as indicator, using a microburette. Note the volume of acid used for neutralization of each solution.

A-5.2.3 Take 2 ml of solution A (corresponding to 0.08 g of the material) in a Nessler cylinder. Add the known quantity of standard hydrochloric acid, necessary for neutralization of solution A (see A-5.2.2.1) and water to make up the volume to 4 ml. Stir carefully and add 1.5 ml of standard hydrochloric acid, 0.5 ml of methyl violet indicator, 0.25 ml of tartaric acid and 0.3 ml of 10 percent (*w/v*) ammonium thiocyanate solution. Carry out a control test in another Nessler cylinder using 0.4 ml of standard zinc solution and 2 ml of solution B and other reagents in the same quantities as with the material.

A-5.2.4 The limit prescribed in Table 1 shall be taken as not having been exceeded if the colour produced by the sample is not more intense than that produced in the control test.

A-5.3 Alternate Method of Determination of Zinc**A-5.3.1 Apparatus**

A-5.3.1.1 Nessler cylinders — 50 ml capacity (see IS : 4161-1967*).

*Specification for Nessler cylinders.

A-5.3.2 Reagents

A-5.3.2.1 Dilute hydrochloric acid — 5 N approximately.

A-5.3.2.2 Ammonium thiocyanate solution — 57 percent (w/v).

A-5.3.2.3 Dilute sulphuric acid — 1 N approximately.

A-5.3.2.4 *p*-dimethyl-aminostyryl- β -naphthiazole methiodide solution — 0.05 percent (w/v) in absolute industrial methylated spirit.

A-5.3.3 Procedure — Weigh accurately 0.5 g of the material and dissolve in required quantity of dilute hydrochloric acid, filter through a sintered-glass crucible (G No. 4), wash with water and make up the filtrate to 200 ml. To 10 ml of this solution add 0.05 ml of ammonium thiocyanate solution, 0.25 ml of dilute sulphuric acid and 0.4 ml of *p*-dimethyl-aminostyryl- β -naphthiazole methiodide solution. Carry out a control test using 10 ml of water and reagents in the same quantities as used in the test.

A-5.3.3.1 The material shall be taken as having satisfied the requirements of the test if the solution containing the material does not show any pink or orange colour in comparison to the solution made for control test.

A-6. DETERMINATION OF LEAD**A-6.1 Apparatus**

A-6.1.1 Nessler Cylinders — two, of 50 ml capacity (see IS : 4161-1967*).

A-6.2 Reagents

A-6.2.1 *p*-Nitrophenol Indicator Solution — Dissolve 0.2 g of *p*-nitrophenol in hot water and dilute to 100 ml.

A-6.2.2 Dilute Ammonium Hydroxide — 1 : 9.

A-6.2.3 Dilute Hydrochloric Acid — 1 : 99.

A-6.2.4 Hydrogen Sulphide Solution — saturated and freshly prepared.

A-6.2.5 Standard Lead Solution — Dissolve 1.60 g of lead nitrate [Pb(NO₃)₂] in water and make up the solution to 1 000 ml with water. Pipette out 10 ml of this solution and dilute again to 100 ml with water. One millilitre of this solution contains 0.1 mg of lead (as Pb).

A-6.3 Procedure — Weigh accurately 2.00 g of the material and dissolve in 20 ml of dilute (1 : 99) hydrochloric acid in a Nessler cylinder and add one drop of *p*-nitrophenol indicator solution. Add dropwise dilute ammonium hydroxide until the solution becomes colourless and then add 0.5 ml of alkali in excess. Add 5 ml of hydrogen sulphide solution, dilute to the mark and mix well. Carry out a control test in a similar manner in another Nessler cylinder using 6 ml of standard lead solution.

*Specification for Nessler cylinders.

A-6.3.1 The limit prescribed in Table 1 shall be taken as not having been exceeded if the intensity of colour produced with the material is not greater than that produced in the control test.

A-7. DETERMINATION OF COPPER

A-7.1 Apparatus

A-7.1.1 Nessler Cylinders — two, of 50 ml capacity (see IS : 4161-1967*).

A-7.2 Reagents

A-7.2.1 Sodium Diethyldithiocarbamate Solution — Dissolve 1.0 g of sodium diethyldithiocarbamate in 1 000 ml of copper-free water. Filter and keep in an amber bottle and protect from strong light.

A-7.2.2 Dilute Hydrochloric Acid — approximately 3 N.

A-7.2.3 Sodium Pyrophosphate Solution — 10 percent (w/v).

A-7.2.4 Standard Copper Solution — Dissolve 0.392 8 g of copper sulphate pentahydrate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) in copper-free water and make up the volume to 1 000 ml. Dilute 100 ml of this solution again to 1 000 ml. One millilitre of the diluted solution contains 0.01 mg of copper (as Cu).

A-7.2.5 Isoamyl Alcohol

A-7.2.6 Ethyl Alcohol — redistilled.

A-7.2.7 Disodium Ethylene Diamine Tetra Acetate (EDTA) Solution — 5 percent (w/v).

A-7.3 Procedure — Weigh accurately about 2 g of the sample into a 100 ml flask and moisten with 10 ml of water. Add 5 ml of dilute hydrochloric acid. After the sample has completely dissolved transfer the solution to a 50 ml Nessler cylinder. Make up the volume to 40 ml with water. Add 1 ml of EDTA solution, 2 ml of sodium pyrophosphate solution and mix. Add 7 ml of isoamyl alcohol, 1 ml of sodium diethyldithiocarbamate solution (two portions of 1 ml each) and quickly stir the solution after each addition. Carry out a control test in a similar manner in another Nessler cylinder, containing the same volume of water and dilute hydrochloric acid, 1 ml of standard copper solution, 1 ml of EDTA solution, 2 ml of sodium pyrophosphate, 7 ml of isoamyl alcohol and 2 ml of sodium diethyldithiocarbamate solution, added likewise in two portions.

A-7.3.1 The limit prescribed in Table 1 shall be taken as not having been exceeded if the colour of the alcohol layer of the test liquid is not more intense than the colour of the alcohol layer in the control test.

*Specification for Nessler cylinders.

A-8. DETERMINATION OF IRON**A-8.1 Apparatus**

A-8.1.1 Nessler Cylinders — 50 ml capacity (see IS : 4161-1967*).

A-8.2 Reagents

A-8.2.1 Dilute Hydrochloric Acid — 4 N approximately.

A-8.2.2 Potassium Permanganate Solution — 0.01 N approximately.

A-8.2.3 Ammonium Thiocyanate Solution — 50 percent (w/v).

A-8.2.4 Extraction Solvent — prepared by mixing equal volumes of amyl alcohol and amyl acetate, both of reagent quality.

A-8.2.5 Standard Iron Solution — Dissolve 0.702 g of ferrous ammonium sulphate [$\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$] in water containing 10 ml of dilute sulphuric acid (10 percent v/v) and dilute with water to 1 000 ml. Before use, again dilute 100 ml of this solution to 1 000 ml. One millilitre of this diluted solution is equivalent to 0.01 mg of iron (as Fe).

A-8.3 Procedure — Weigh accurately 1.000 g of the material and dissolve in 20 ml of water and just sufficient hydrochloric acid. Add 1 ml more of dilute hydrochloric acid. Add 1 drop of potassium permanganate solution and mix. Add 5 ml of ammonium thiocyanate solution and 10 ml of extraction solvent. Shake vigorously and allow the layers to separate. Carry out a control test in a similar manner in another Nessler cylinder, containing in the same volume, 0.5 ml of standard iron solution in place of the material and the same amounts of reagents.

A-8.3.1 The material shall be taken to have not exceeded the limit prescribed in Table 1 if the intensity of colour obtained with the material is not greater than that obtained in the control test.

APPENDIX B

(Clause 2.3)

DETECTION OF MERCURY IN CADMIUM OXIDE**B-1. REAGENTS**

B-1.1 Sodium Cyanide — solid.

B-1.2 Alkaline Stannous Chloride Solution — Dissolve 1.2 g of stannous chloride in 20 ml of water disregarding the precipitate formed by

*Specification for Nessler cylinders.

hydrolysis. Pour while stirring into of 20 percent sodium hydroxide solution and continue stirring until the precipitate is dissolved.

B-2. PROCEDURE

B-2.1 Dissolve 15 g of sodium cyanide and 6 g of material in water, filter and dilute to 100 ml in a Nessler cylinder. Add 2 ml of the alkaline stannous chloride and mix.

B-2.2 A turbidity indicates the presence of mercury and is visible if 0.0002 g or more of mercury is present.

APPENDIX C

(Clause 5.1)

SAMPLING OF CADMIUM OXIDE FOR ELECTROPLATING

C-1. GENERAL REQUIREMENTS OF SAMPLING

C-1.0 In drawing, preparing, storing and handling samples, the following precautions and directions shall be observed.

C-1.1 Samples shall be taken in a protected place not exposed to damp air, dust or soot.

C-1.2 The sampling instrument shall be clean and dry.

C-1.3 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

C-1.4 To draw a representative sample, the contents of each container selected for sampling shall be mixed as thoroughly as possible by suitable means.

C-1.5 The samples shall be placed in suitable, clean, dry and air-tight glass bottles or other suitable containers on which the material has no action.

C-1.6 The sample containers shall be of such a size that they are almost completely filled by the sample.

C-1.7 Each sample container shall be sealed air-tight after filling, and marked with full details of sampling, and the date of sampling.

C-2. SCALE OF SAMPLING

C-2.1 Lot— All the containers in a single consignment of the material drawn from a single batch of manufacture shall constitute the lot. If a consignment is declared to consist of different batches of manufacture, the batches shall be marked separately and the groups of containers in each batch shall constitute separate lots.

C-2.2 For ascertaining the conformity of the material in any lot to the requirements of this specification, samples shall be tested for each lot separately. The number of containers to be selected at random from lots of different sizes shall be in accordance with Table 2.

TABLE 2 NUMBER OF CONTAINERS TO BE SELECTED FROM LOTS OF DIFFERENT SIZES

LOT SIZE N (1)	SAMPLE SIZE n (2)
3 to 15	3
16 " 40	4
41 " 110	5
111 " 180	6
181 " 300	7
301 " 500	8
501 " 800	9
801 and above	10

C-2.3 In order to ensure randomness of selection, random number tables shall be used. If such tables are not available, the following procedure is recommended for use:

Arrange all the containers in the lot in a systematic manner and starting from any one, count them as 1,2,3.....up to r and so on, where r is the integral part of N/n (N and n being the lot size and sample size respectively). Every r th container thus counted shall be withdrawn to constitute the sample.

C-3. INDIVIDUAL SAMPLES AND COMPOSITE SAMPLE

C-3.1 From each of the containers selected according to C-2.3, a representative portion of the material sufficient for carrying out the tests specified under 2 shall be drawn and these shall constitute the individual samples.

C-3.2 From each of the individual samples, a small but equal quantity of the material shall be taken and thoroughly mixed to constitute a composite sample.

C-3.3 The material in the individual and composite samples shall be transferred to separate bottles and labelled with full identification particulars of the samples.

C-4. NUMBER OF TESTS

C-4.1 Tests for the determination of cadmium oxide content shall be carried out on each of the individual samples.

C-4.2 Tests for the remaining characteristics shall be done on the composite sample.

C-5. CRITERIA FOR CONFORMITY

C-5.1 For Individual Samples — For cadmium oxide content the mean and range of test results shall be computed as follows:

$$\text{Mean } (\bar{X}) = \frac{\text{sum of individual test results}}{\text{number of tests}}$$

$$\text{Range } (R) = \text{difference between the maximum and minimum value of the test results}$$

C-5.1.1 The lot shall be declared to have satisfied the requirements for cadmium oxide content if $\bar{X} - 0.6 R \geq 99.0$.

C-5.2 For Composite Sample — For declaring the conformity of the lot to the requirements of all other characteristics, the test results on the composite sample shall meet the corresponding requirements specified.

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Conversion
Force	newton	N	1 N = 1 kg.1 m/s ²
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m ²
Frequency	hertz	Hz	1 Hz = 1 c/s (s ⁻¹)
Electric conductance	siemens	S	1 S = 1 A/V
Pressure, stress	pascal	Pa	1 Pa = 1 N/m ²

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Eastern : 5 Chowringhee Approach	CALCUTTA 700072	23-08 02
Southern : C. I. T. Campus, Adyar	MADRAS 600020	41 24 42

Branch Offices:

'Pushpak', Nurmohamed Shaikh Marg, Khanpur	AHMADABAD 380001	2 03 91
'F' Block, Unity Bldg, Narasimharaja Square	BANGALORE 560002	2 76 49
Gangotri Complex, Bhadbhada Road, T.T. Nagar	BHOPAL 462003	6 27 16
22E Kalpana Area	BHUBANESHWAR 751014	5 36 27
Ahimsa Bldg, SCO 82-83, Sector 17C	CHANDIGARH 160017	2 83 20
5-8-56C L. N. Gupta Marg	HYDERABAD 500001	22 10 83
D-277 Todarmal Marg, Banipark	JAIPUR 302006	6 98 32
117/418 B Sarvodaya Nagar	KANPUR 208005	8 12 72
Patliputra Industrial Estate	PATNA 800013	6 28 08
Hantex Bldg (2nd Floor), Rly Station Road	TRIVANDRUM 695001	32 27